

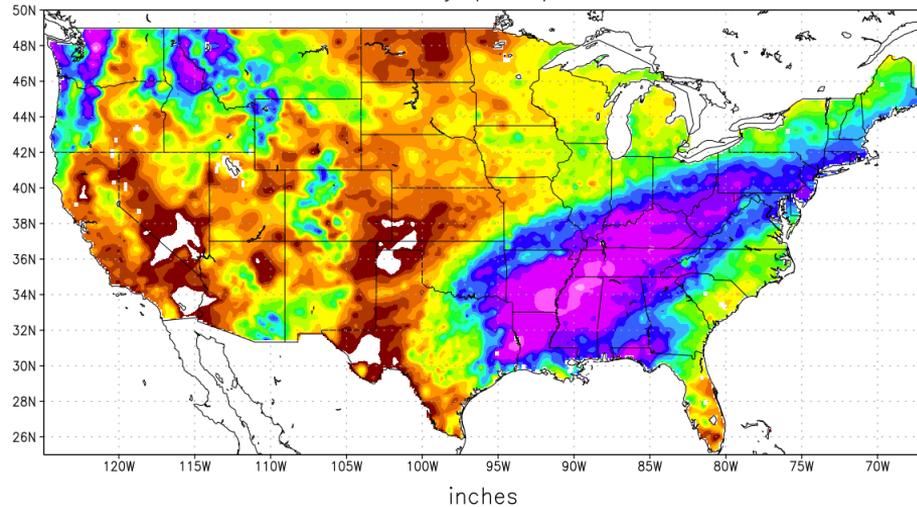
# NLDAS-2 precipitation issue (Feb 2018)

Illinois state climatologists first reported in mid-March to the NOAA and NASA NLDAS team that the NLDAS-2 soil moisture was dry compared to in situ soil moisture observations.

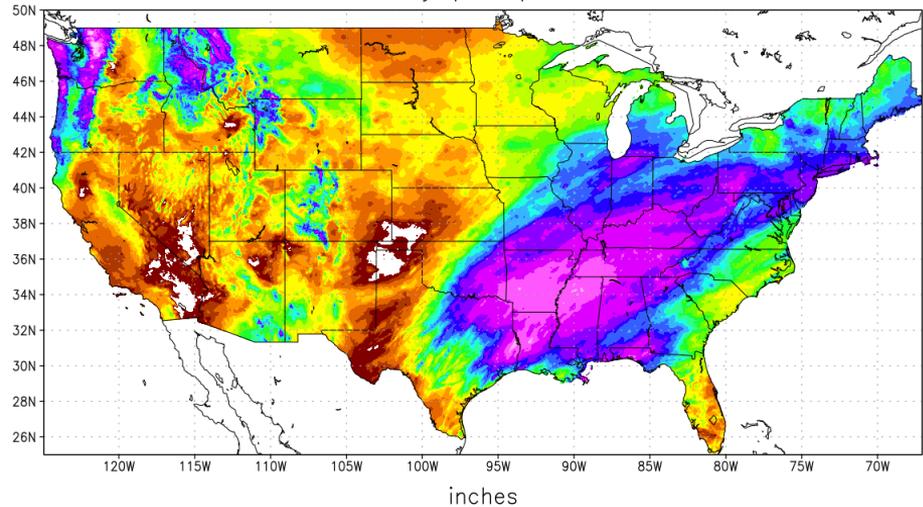
- Feb 2018 was particularly wet in Illinois, but not reflected in NLDAS-2.
- Further analysis reveals that for two entire days in the middle of February, there was no precipitation at all over CONUS. These two days happened to be heavy rain events in the central U.S.
- The following figures compare the NLDAS-2 precipitation with the PRISM analysis, using both monthly and daily values. Daily is from 12Z to 12Z, which corresponds to the CPC daily gauge analysis used for NLDAS-2.
- PRISM is at 4km, and NLDAS-2 at 0.125-deg. For difference figures, PRISM was regridded to 0.125-deg. PRISM is only available over CONUS.

# NLDAS-2 and PRISM – Feb 2018 average

NLDAS-2 monthly precip FEB 2018



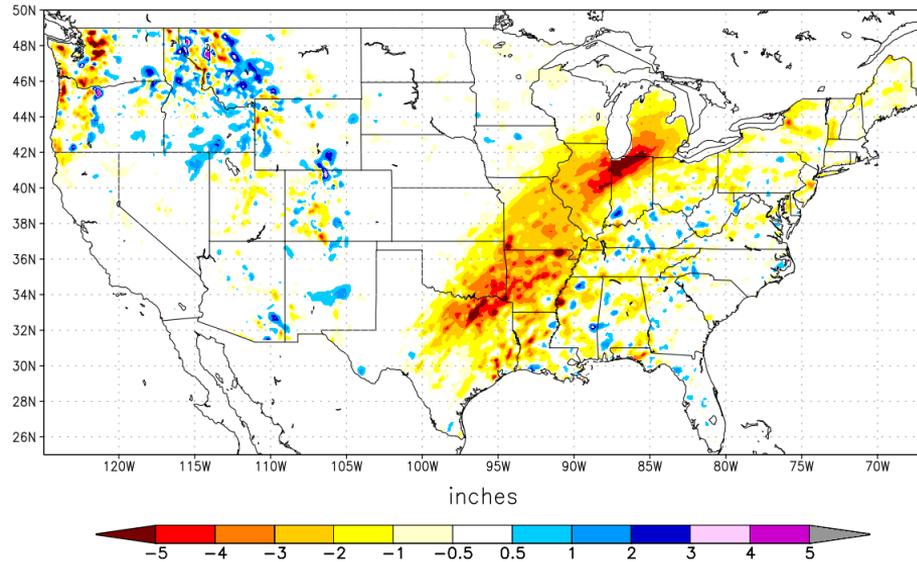
PRISM monthly precip FEB 2018



- Overall pattern is similar, but the PRISM high rainfall amounts extend further north into Illinois and Michigan compared to NLDAS-2.
- Remember, PRISM here is plotted at 4km, while NLDAS-2 is at 0.125-deg.
- NLDAS-2 was masked to only plot over CONUS.

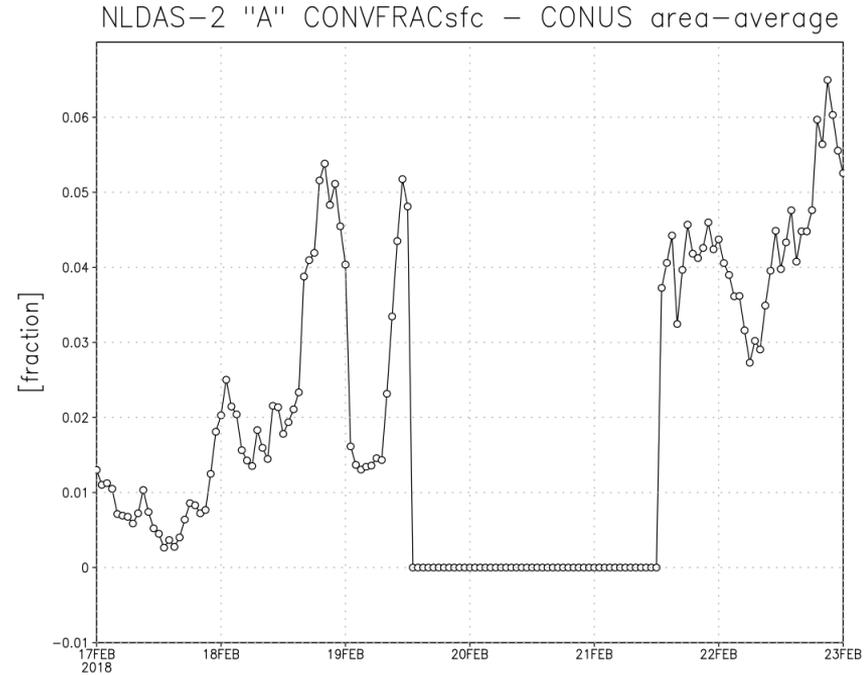
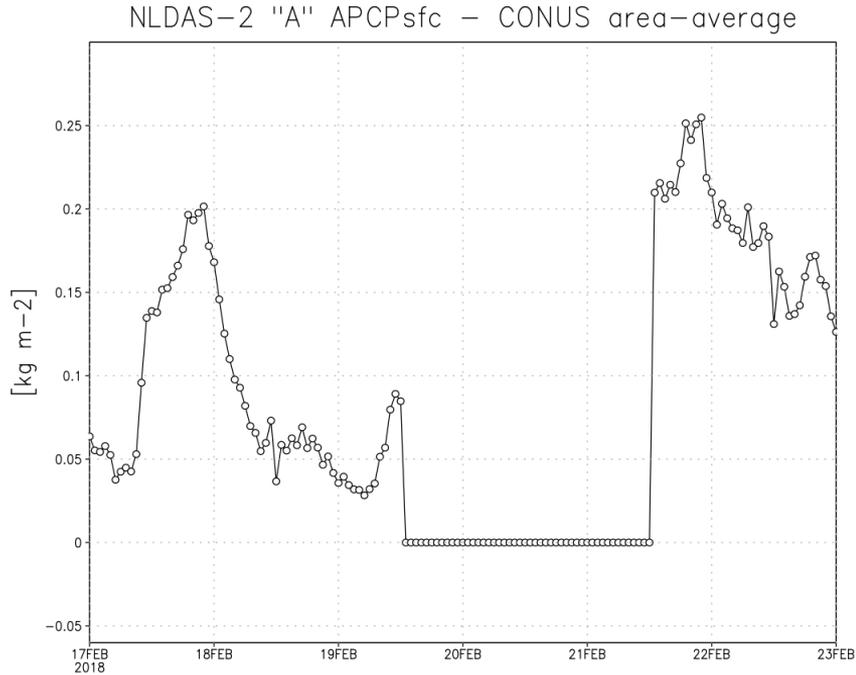
# Feb 2018 difference

NLDAS-2 minus PRISM FEB 2018



- NLDAS-2 has 2 inches less precip than PRISM over most of Illinois, with dry bias amounts over 5 inches over the month in parts of the central U.S. extending from Texas to Michigan.
- The localized differences between NLDAS-2 and PRISM in the mountainous NW U.S. are due to differences in interpolation and use of individual gauges between the two products.

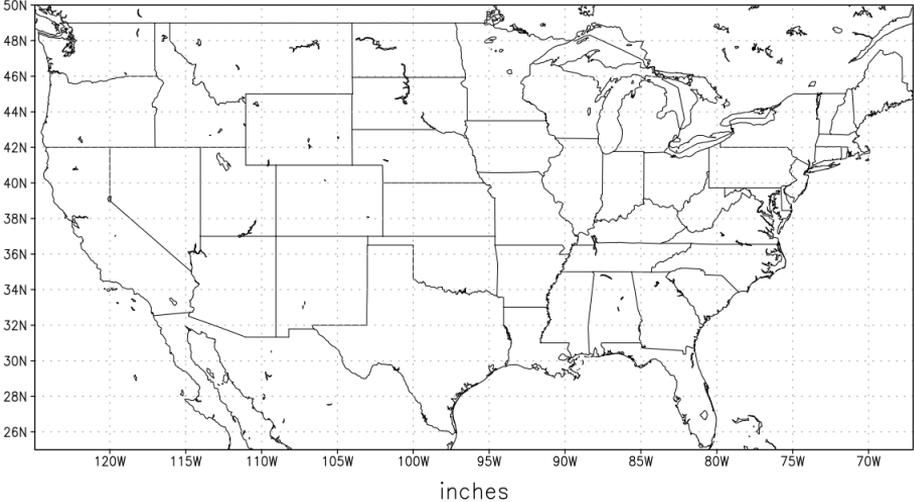
# NLDAS-2 time series



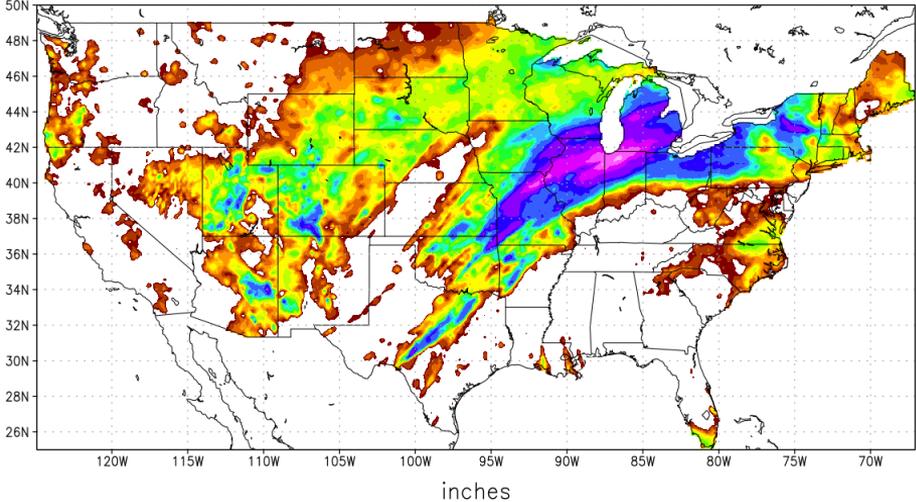
- Area-average time series of hourly precipitation (left) over CONUS revealed a two-day period with no precipitation in NLDAS-2.
- From 12Z 19Feb2018 to 12Z 21Feb2018, NLDAS-2 has no precipitation within CONUS.
- Hourly convective precipitation fraction (right) also shows zero precipitation.

# Daily average 12Z 19Feb2018 – 12Z 20Feb2018

NLDAS-2 daily precip 12Z19FEB2018-12Z20FEB2018



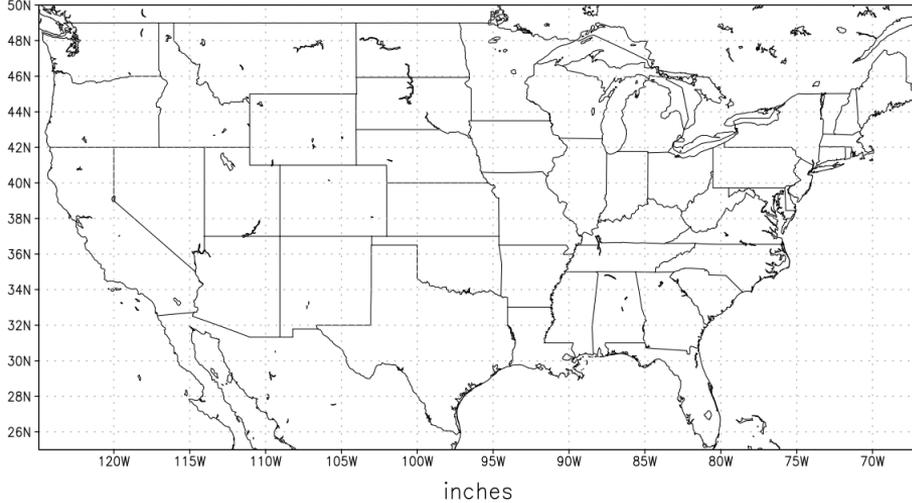
PRISM daily precip 12Z19FEB2018-12Z20FEB2018



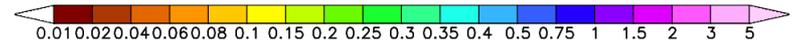
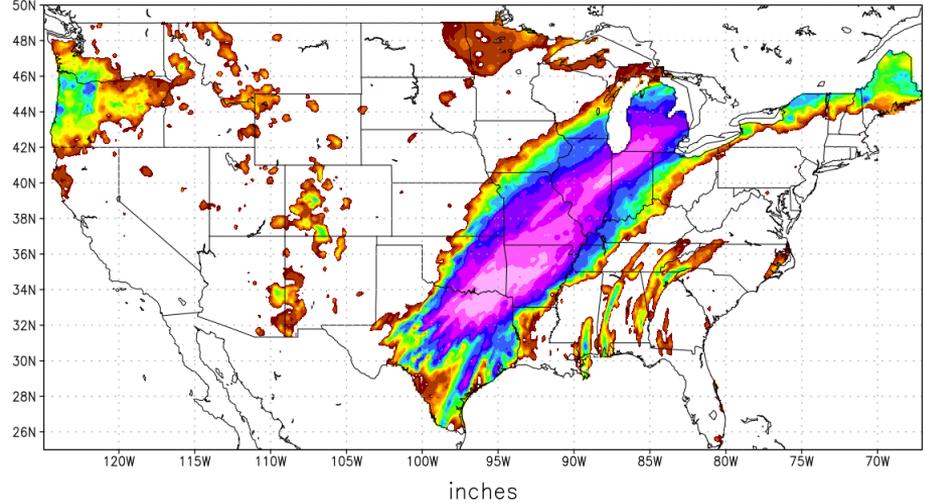
- Zero precip from NLDAS-2 for this entire 24-hour period.
- Heavy rain centered in northern Illinois in the PRISM analysis during the same period.

# Daily average 12Z 20Feb2018 – 12Z 21Feb2018

NLDAS-2 daily precip 12Z20FEB2018–12Z21FEB2018



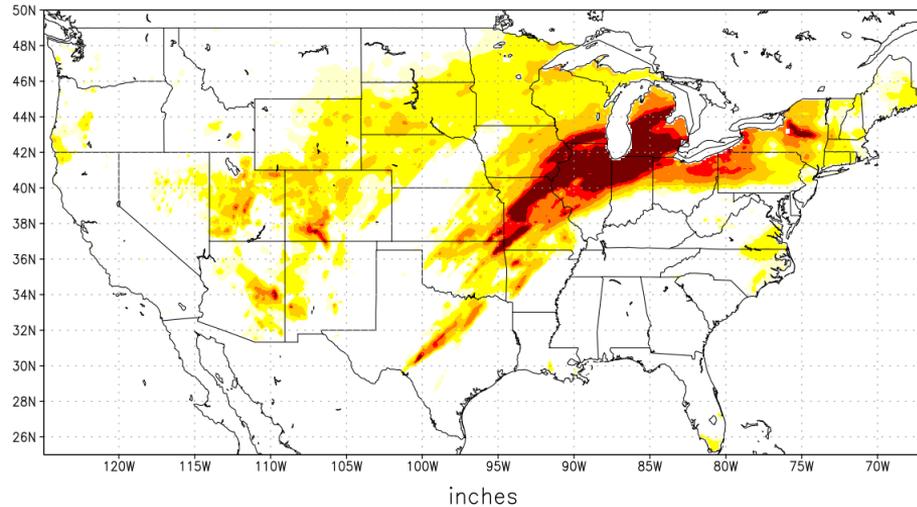
PRISM daily precip 12Z20FEB2018–12Z21FEB2018



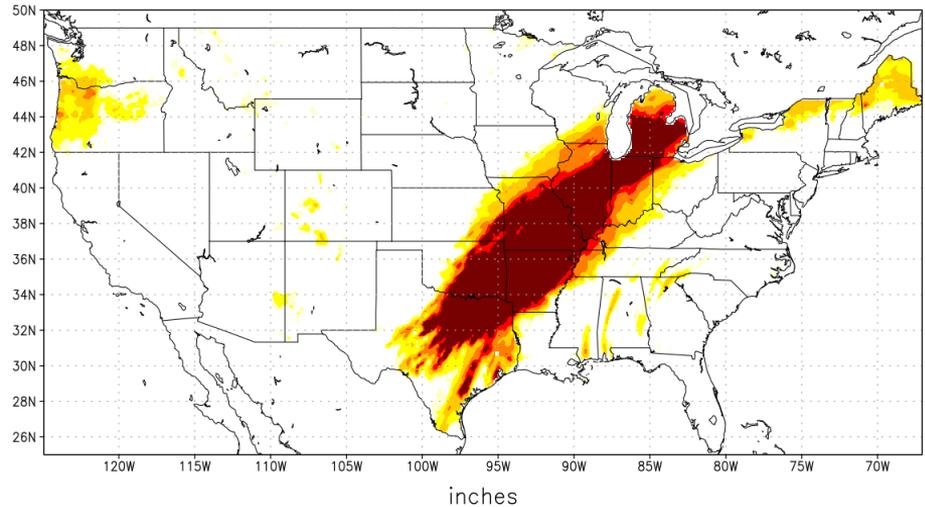
- Zero precip from NLDAS-2 for this entire 24-hour period.
- Heavy rain from NE Texas into Michigan in the PRISM analysis during the same period.

# Differences for these two dates

NLDAS-2 minus PRISM 12Z19FEB2018-12Z20FEB2018



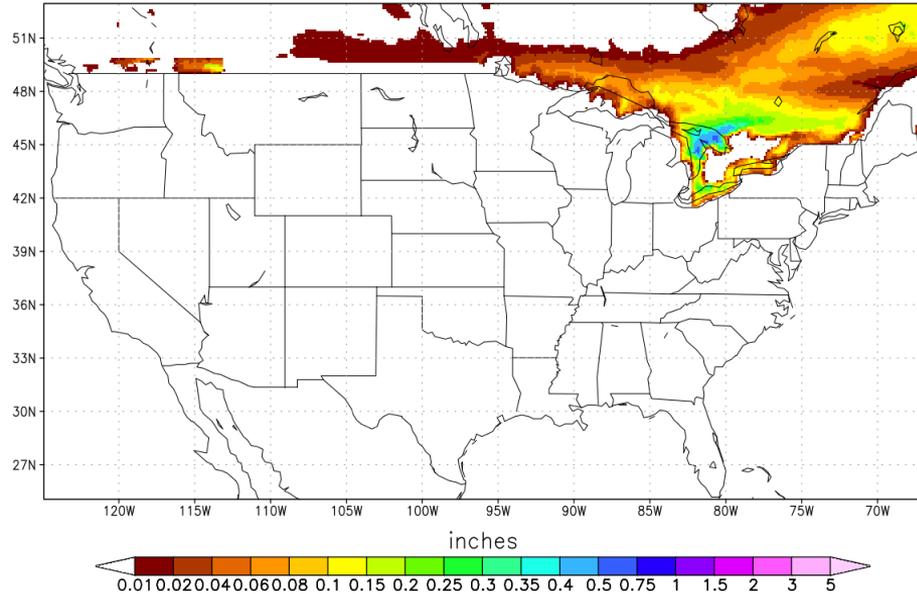
NLDAS-2 minus PRISM 12Z20FEB2018-12Z21FEB2018



- Plots confirm that NLDAS-2 has significantly less precip (aka, zero) as compared to PRISM.
- Other dates during the month do not appear to have any significant bias – it's only these two 24-hour periods.

# Quick look at the entire NLDAS-2 domain

NLDAS-2 APCPsfrc 12Z19FEB2018-12Z20FEB2018



- Plotting the entire NLDAS-2 domain shows the precip is only zero over CONUS.
- NLDAS-2 uses the CPC daily gauge analysis in CONUS, a different CPC gauge analysis in Mexico, and NARR model precipitation in Canada.
- Further analysis revealed that the CPC daily gauge analysis files were sent to NLDAS for the daily operation updates; however, the precip fields on these two days all had undefined (aka, zero) values over CONUS.

# NLDAS-2 precipitation issue (Feb 2018)

The NLDAS team is working to keep this from happening again.

- The previous operational scripting only checked to see if the CPC CONUS daily gauge analysis file was available operationally or not. If not, then the NARR model precipitation is used as a replacement. However, the script did not check if the files were available, but the values all undefined/zero.
- The script is being updated to check that there are realistic values from this field. It appears to be the first time this occurred in the ~10 years of quasi- or NCO operational production of NLDAS-2 precipitation.
- The precipitation was zero from a glitch originating at CPC for these two days. CPC has since corrected their gauge analysis. The NLDAS team is evaluating the possibility of correcting the NLDAS-2 data with a re-run.  
**For now, the NLDAS-2 soil moisture, especially in the central U.S., will be drier than the actual conditions, until the system recovers.**